

ABET 3i

Lifelong Learning
and
Information Literacy

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The Need for Lifelong Learning

- “It has been said that the “half-life” of engineering knowledge—the time in which half of what an engineer knows becomes obsolete—is in the range of two to eight years.”

Wm. A. Wulf, President of the National Academy of Engineering 2006, and George M. C. Fisher (chairman of the NAE Council and retired chairman and CEO of the Eastman Kodak Company).
http://www.issues.org/18.3/p_wulf.html

The Need for Lifelong Learning

Professional Competency Required

“Business as Usual” Competency

Figure 1. Life-Long Learning is required to maintain technical vitality.

Yeagan, J, K. Laker, J. Aukland, and D. Jackson, “Lifelong Learning – Industry 2000 Continued.”
<http://fie.enrqn.pitt.edu/fie96/papers/366.pdf>

ABET Criterion 3i: Two Components

- Each program must demonstrate that its students attain:
 - A recognition of the need for, and
 - Ability to engage in life-long learning.

ABET. <http://www.abet.org/Linked%20Documents-UPDATE/Criteria%20and%20PP/E001%2007-08%20EAC%20Criteria%2011-15-06.pdf>

Lifelong Learning

Recognize need AND Ability to engage in

Recognize Need

What are the characteristics or attributes of students who “Recognize the Need” for LL?

Ability to Engage In LL

What are the skills that demonstrate the “Ability to engage in Lifelong Learning?”

LifeLong Learning

- What does “lifelong learning” mean?
- What does a Lifelong Learner “look like”? What kinds of skills does a “Lifelong Learner” have?
- How are these skills taught? What experiences help develop lifelong learning skills?
- How are these skills measured?

Students



Lifelong learning means:

- "...you're able to learn whatever skills you need to do whatever you want to do."

Cassandra Fowler
Graduate Student
Civil & Environmental
Engineering

Students



Lifelong learning means:

- "...to continue to study for the rest of my life."

Kimia Seyedmadani
Undergraduate
Bioengineering

Students



Lifelong learning means:

- "...challenging your mind with different things."
- Learn... through reading or activities.
- "Keeping yourself challenged."

Rajen Sidhu
Graduate Student
School of Materials

Recent Graduate



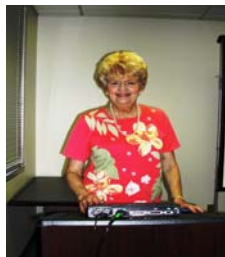
Lifelong learning means:

- "Learning how to learn so you can continue to learn"
- "Knowing where to look"
- "Knowing what resources are available ...so you can find the information you need."

Teresa J. Clement PhD
School of Materials
May 2007

Faculty

- "Actively learning new ways to help solve problems... continuing to add to your knowledge"
- "Since Engineers solve problems, the more tools they have...to solve these problems the better engineer they are going to be."



Dr. Mary Anderson-Rowland
Asc Professor
Industrial Engineering

Faculty

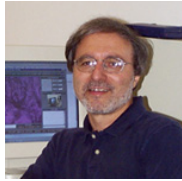
- "LL is the act of constantly probing, questioning and seeking information in one's own professional field or any other field of interest."



Dr. Norma Hubele
Industrial Engineering
Professor Emeritus
Statistical Consultant

Faculty

- “A proactive effort to gather knowledge with an intrinsic interest in something or some objective...”
- “The recognition that one continues to seek, acquire, analyze information way past their degree program...the degree program is the foundation...”



Dr. Vincent Pizziconi
Asc. Professor
Bioengineering

Characteristics of a Lifelong Learner

- “Curious”
- “Interested in new developments and topics”
- “Intensely interested”

Characteristics of a Lifelong Learner

- “Inquiring mind... a love of learning...”
- “Helicopter vision... a sense of interconnectedness of fields...”
- “Information literacy”
- “Personal agency... self-organization skills...”
- “Repertoire of learning skills... range of strategies...”

Candy, P. C., et. al. (1994) p. 43.
http://www.dest.gov.au/sectors/training_skills/publications_resource_s/profiles/nbeet/hec/developing_lifelong_learners_through_undergraduate.htm

Students: How do you learn on your own?

- Information seeking strategies
 - “It depends on what is needed...go to the manufacturer, manual, library, web, find someone who had done it. Try it.”
 - “Three pronged method: Google & Wikipedia, journals and textbooks. Sometimes start with a text. Discuss with other people.”
 - “Try to find someone who understands the concept better than I do. Research the internet...go to a librarian.”
 - “Develop a problem statement...goals, set tasks, what tools do I need...attack, library, online...who does this work? Meet and talk with that person.”

What are Lifelong Learning Skills? (Faculty and Students)

- “Computer skills,” “Internet skills”
- “Being able to learn from multiple ways”
- Able to “ask the right questions...the key to learning.”
- “Critical reading”
- “Research skills”
- Able to “gather, know and use information”
- “Analytical skills in writing and discussion.”
- “Recognize what is not valuable...discrimination”

Lifelong Learning Skills

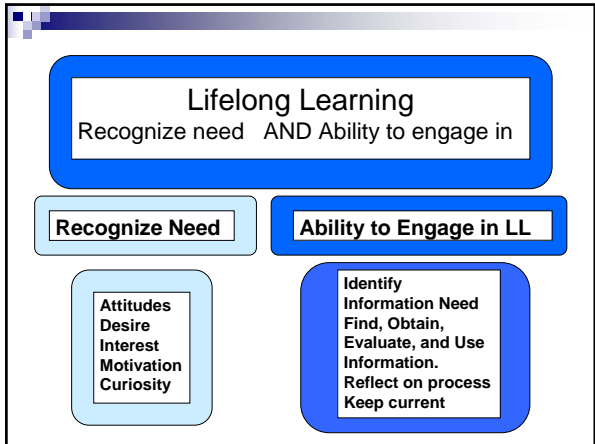
- “Demonstrate reading writing, listening, and speaking skills
- Demonstrate an awareness of what needs to be learned
- Follow a learning plan
- Identify, retrieve, and organize information
- Understand and remember new information
- Reflect on one’s own understanding”

Shuman et. al. 2005

Lifelong Learning Skills

- “Be proficient in the use of a variety of informational and educational media such as textbooks, scientific and technical journals, the library system as a whole, the World Wide Web, and educational software.”
- “Have an awareness of the dynamic, evolving nature of science, engineering, technology and industry and an understanding that learning does not end with the B.S. degree”

Briedis (2001)



Faculty: How are LL Skills taught?

- **Inspire**
 - “Tap their thirst for information by laying the excitement of new knowledge...”
 - “Connect the idea that they are problem solvers and technology is moving so fast, if they stay where they are, they will be obsolete.”
- **Engage**
 - Assignments that require finding and using information
 - The design process requires that students learn different kinds of knowledge as it applies to their design.

How are LL Skills taught?

- “Experiential and real-world learning”
- “Resource-based and Problem-based learning”
- “Reflective practice and critical self-awareness”

Candy, P. C. (1995)

How are LL Skills Measured? ABET: Assessment Definitions

- **“Outcomes:**
 - Statements that describe what students are expected to know and be able to do by the time of graduation”
- **“Performance Criteria*"**
 - Specific, measurable statements
 - identifying the performance(s) required to meet the outcome, confirmable through evidence.”

* “It is important to note that the ABET Criteria are silent in regard to Performance Criteria. However, in order to have valid assessment of an outcome, it must be defined in terms of measurable statements.”

ABET Training - Pre-Work, Module 4
http://www.abet.org/_TrainingCD/index.htm

Assessment Definitions

- **Assessment:** “Processes that identify, collect, use, and prepare data that can be used to evaluate achievement.”¹
- **Direct Assessments:** “...provide for the direct examination or observations of student knowledge or skills against measurable learning outcomes.”²
- **Indirect Assessments:** “...ascertain the perceived extent or value of learning experiences. They assess opinions or thoughts about student knowledge or skill.”²

¹ABET “The Language of Assessment”
² Rogers, G. (2006)
<http://www.abet.org/Linked%20Documents-UPDATE/Newsletters/06-08-CM.pdf>

How are LL Skills Measured? ABET

- “Although the General Criteria are silent on the issue of direct and indirect measures,
- it is important to have at least one **direct method** of assessing any of the Performance Criteria which define the outcome.
- A direct method is one that is based on the direct observation or examination of student performance.”

ABET Training - Pre-Work. Module 4
<http://www.abet.org/TrainingCD/index.htm>

Information Literacy Skills and Lifelong Learning

- Information Literacy Skills demonstrate specific abilities to engage in lifelong learning.

Defined by Measurable Performance Criteria

Assessment using Direct Measures

Information Literacy Standards for Science and Engineering/Technology

- Determines nature and extent of the information need
- Acquires needed information
- Critically evaluates the information and its sources
- Uses information effectively, ethically and legally
- Recognizes the need to keep current

<http://www.ala.org/ala/acrl/acrlstandards/infolitscitech.htm>

Information Literacy and ABET 3i Selected Abilities to Engage in Lifelong Learning

Lifelong Learning Outcome

- “Demonstrate an awareness of what needs to be learned”
- “Follow a learning plan”

Information Literacy Performance Indicator demonstrating this ability

- Formulates questions based on the research need
- Develops a research plan appropriate to the investigative method

Shuman, L.J. et. al. (2005)

<http://www.ala.org/ala/acrl/acrlstandards/infolitscitech.htm>

Selected Abilities to Engage in Lifelong Learning

Lifelong Learning Outcome

- “Follow a learning plan”

Information Literacy Performance Indicator demonstrating this ability

- Acquires information by: selecting sources, designing a research strategy, revising the strategy as needed, retrieves information

Shuman, L.J. et. Al. (2005)

<http://www.ala.org/ala/acrl/acrlstandards/infolitscitech.htm>

Selected Abilities to Engage in Lifelong Learning

Lifelong Learning Outcome

- “Identify, retrieve & organize information”

Information Literacy Performance Indicator demonstrating this ability

- Identifies and retrieves information.
- Extracts and organizes records

Shuman, L.J. et. Al. (2005)

<http://www.ala.org/ala/acrl/acrlstandards/infolitscitech.htm>

Selected Abilities to Engage in Lifelong Learning

Lifelong Learning Outcome

- "Demonstrate critical thinking skills"
- "Reflect on one's own understanding"

Shuman, L.J. et. Al. (2005)

Information Literacy Performance Indicator demonstrating this ability

- Evaluates retrieved information and it's source
- Evaluates the information seeking process

<http://www.ala.org/ala/acrl/acrlstandards/infoitscitech.htm>

Selected Abilities to Engage in Lifelong Learning

Lifelong Learning Outcome

- "Have an awareness of the dynamic, evolving nature of science, engineering, technology and industry and an understanding that learning does not end with the B.S. degree"

Briedis (2001)

Information Literacy Performance Indicator demonstrating this ability

- "Uses a variety of methods and emerging technologies for keeping current in the field."

<http://www.ala.org/ala/acrl/acrlstandards/infoitscitech.htm>

Information Literacy Skills and Lifelong Learning

- Information Literacy Skills demonstrate specific abilities to engage in lifelong learning.

Identifiable Performance Indicators

Assessment using Direct Measures

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